



# USJ60R580Z

*Power MOSFET*

## 9.0A, 600V N-CHANNEL SUPER-JUNCTION MOSFET

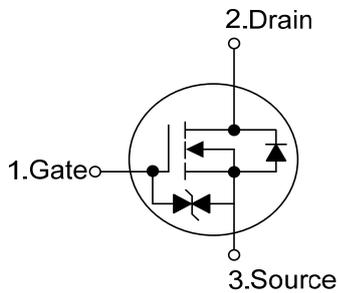
### DESCRIPTION

The **UTC USJ60R580Z** is a Super Junction MOSFET Structure and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and a high rugged avalanche characteristics. This power MOSFET is usually used at AC-DC converters for power applications.

### FEATURES

- \*  $R_{DS(ON)} \leq 0.58 \Omega$  @  $V_{GS}=10V, I_D=1.7A$
- \* Fast switching capability
- \* Avalanche energy tested
- \* Improved dv/dt capability, high ruggedness
- \* With ESD protection

### SYMBOL

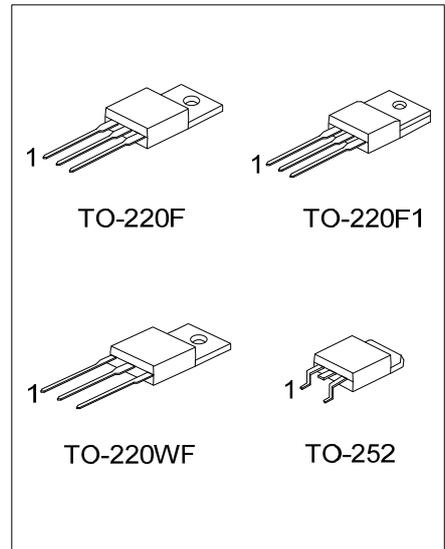


### ORDERING INFORMATION

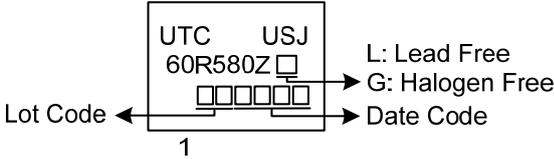
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
USJ60R580ZL-TF1-T	USJ60R580ZG-TF1-T	TO-220F1	G	D	S	Tube
USJ60R580ZL-TF3-T	USJ60R580ZG-TF3-T	TO-220F	G	D	S	Tube
USJ60R580ZL-TW1-T	USJ60R580ZG-TW1-T	TO-220WF	G	D	S	Tube
USJ60R580ZL-TN3-R	USJ60R580ZG-TN3-R	TO-252	G	D	S	Tape Reel

Note: Pin Assignment: G: Gate D: Drain S: Source

<p>USJ60R580ZG-TF1-T</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Green Package</p>	<p>(1) T: Tube, R: Tape Reel</p> <p>(2) TF3: TO-220F, TF1: TO-220F1, TW1: TO-220WF TN3: TO-252</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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■ MARKING



■ ABSOLUTE MAXIMUM RATINGS (T<sub>C</sub>=25°C, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V <sub>DSS</sub>	600	V
Gate-Source Voltage		V <sub>GSS</sub>	±30	V
Drain Current	Continuous	I <sub>D</sub>	9	A
	Pulsed (Note 2)	I <sub>DM</sub>	27	A
Avalanche Energy	Single Pulsed (Note 3)	E <sub>AS</sub>	98	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	1	V/ns
Power Dissipation	TO-220F/TO-220F1	P <sub>D</sub>	26	W
	TO-220WF			
	TO-252		48	W
Junction Temperature		T <sub>J</sub>	+150	°C
Storage Temperature		T <sub>STG</sub>	-55 ~ +150	°C

Notes: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

2. Repetitive Rating: Pulse width limited by maximum junction temperature.

3. L = 100mH, I<sub>AS</sub> = 1.4A, V<sub>DD</sub> = 90V, R<sub>G</sub> = 25 Ω Starting T<sub>J</sub> = 25°C

4. I<sub>SD</sub> ≤ 9.0A, di/dt ≤ 200A/μs, V<sub>DD</sub> ≤ BV<sub>DSS</sub>, Starting T<sub>J</sub> = 25°C

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220F/TO-220F1	θ <sub>JA</sub>	62.5	°C/W
	TO-220WF			
	TO-252		110	°C/W
Junction to Case	TO-220F/TO-220F1	θ <sub>JC</sub>	4.8	°C/W
	TO-220WF			
	TO-252		2.6(Note)	°C/W

Note: Device mounted on FR-4 substrate P<sub>C</sub> board, 2oz copper, with 1inch square copper plate.

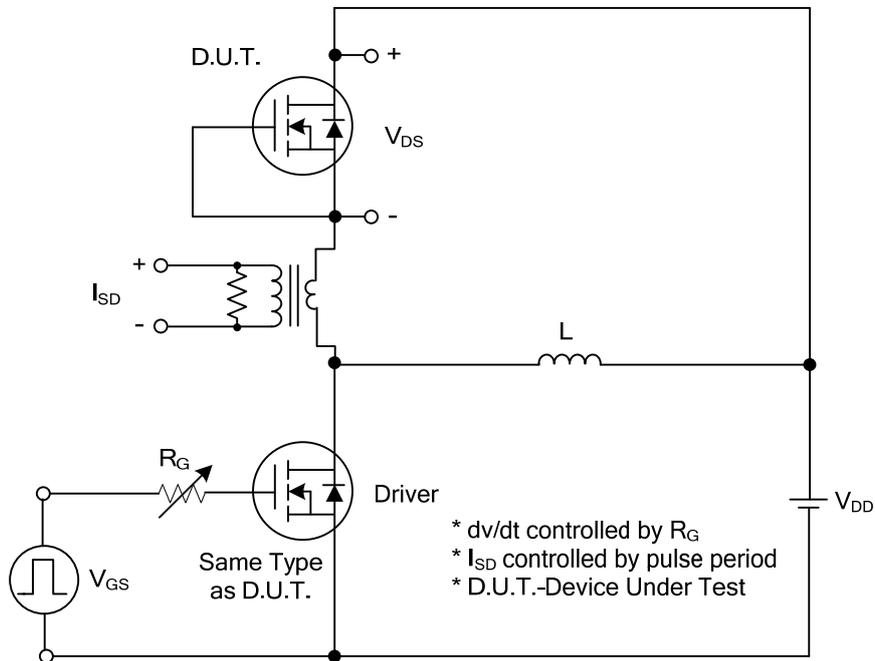
■ ELECTRICAL CHARACTERISTICS (T<sub>J</sub>=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	600			V
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> =600V, V <sub>GS</sub> =0V			10	μA
Gate-Source Leakage Current	Forward	I <sub>GSS</sub> V <sub>DS</sub> =0V, V <sub>GS</sub> =25V			10	μA
	Reverse		V <sub>DS</sub> =0V, V <sub>GS</sub> =-20V			-10
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	2.5		4.5	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =1.7A			0.58	Ω
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =50V, f=1.0MHz		418		pF
Output Capacitance	C <sub>OSS</sub>			138		pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			9		pF
<b>SWITCHING PARAMETERS</b>						
Total Gate Charge (Note 1)	Q <sub>G</sub>	V <sub>DS</sub> =480V, V <sub>GS</sub> =10V, I <sub>D</sub> =9A (Note 1, 2)		21		nC
Gate to Source Charge	Q <sub>GS</sub>			7		nC
Gate to Drain Charge	Q <sub>GD</sub>			8		nC
Turn-ON Delay Time (Note 1)	t <sub>D(ON)</sub>	V <sub>DD</sub> =100V, V <sub>GS</sub> =10V, I <sub>D</sub> =9A, R <sub>G</sub> =25Ω (Note 1, 2)		13		ns
Rise Time	t <sub>R</sub>			22		ns
Turn-OFF Delay Time	t <sub>D(OFF)</sub>			50		ns
Fall-Time	t <sub>F</sub>			37		ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Continuous Drain-Source Diode Forward Current	I <sub>S</sub>				9	A
Drain-Source Diode Forward Voltage (Note 1)	V <sub>SD</sub>	I <sub>S</sub> =9A, V <sub>GS</sub> =0V			1.4	V
Body Diode Reverse Recovery Time(Note 1)	t <sub>rr</sub>	I <sub>S</sub> =9A, V <sub>GS</sub> =0V, dI <sub>F</sub> /dt=100A/μs		258		ns
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>				2.4	

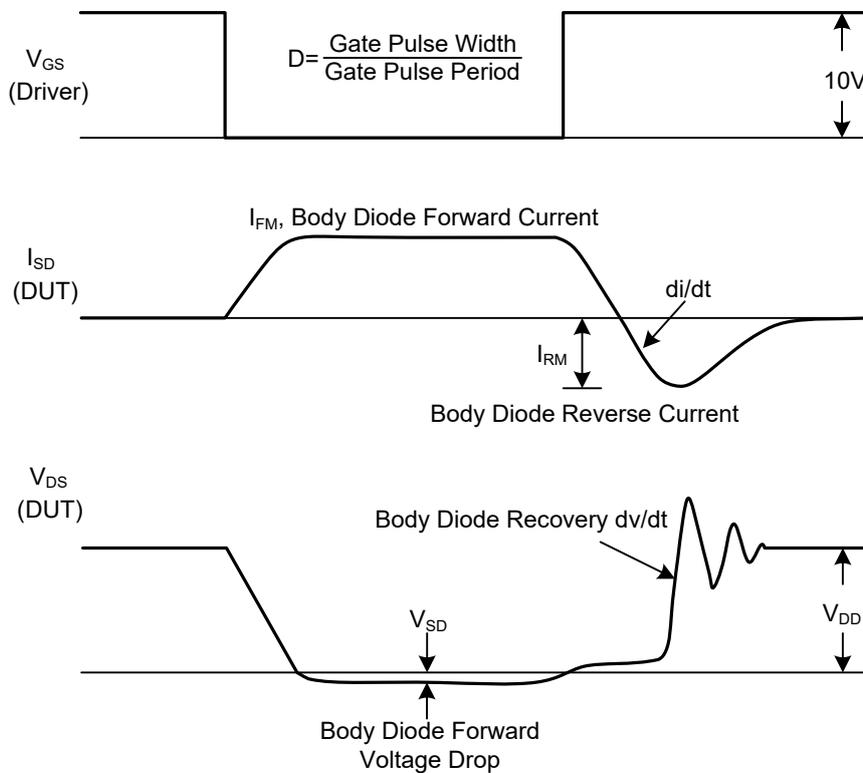
Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

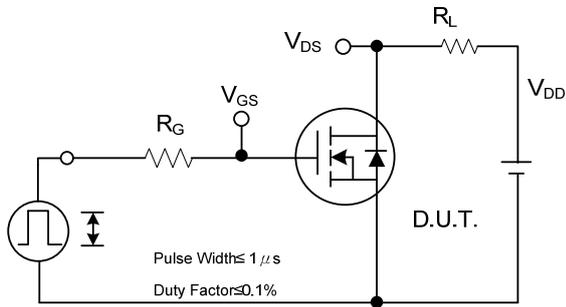


Peak Diode Recovery  $dv/dt$  Test Circuit

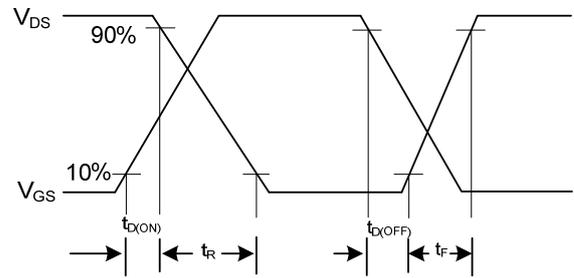


Peak Diode Recovery  $dv/dt$  Waveforms

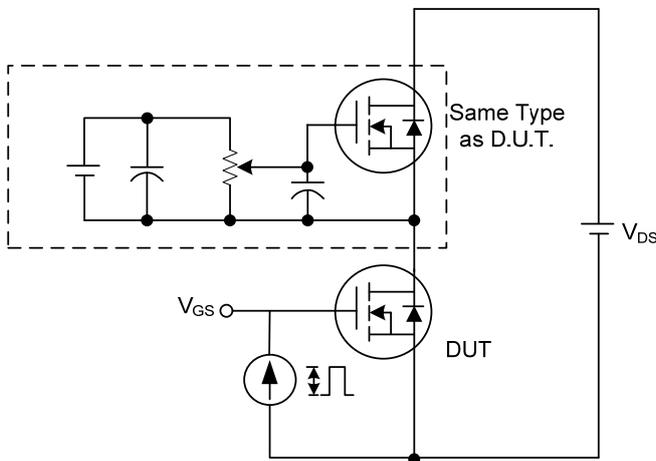
## TEST CIRCUITS AND WAVEFORMS



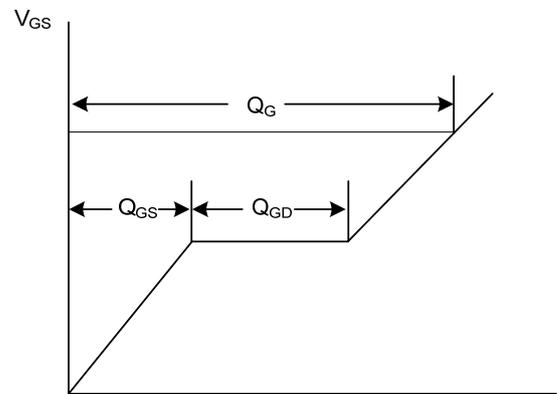
Switching Test Circuit



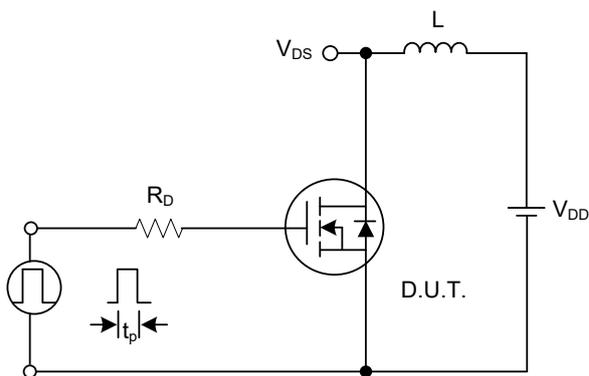
Switching Waveforms



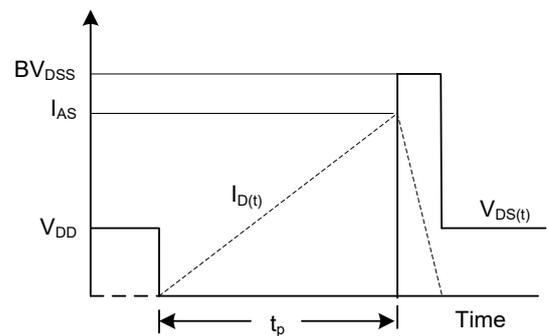
Gate Charge Test Circuit



Charge  
Gate Charge Waveform

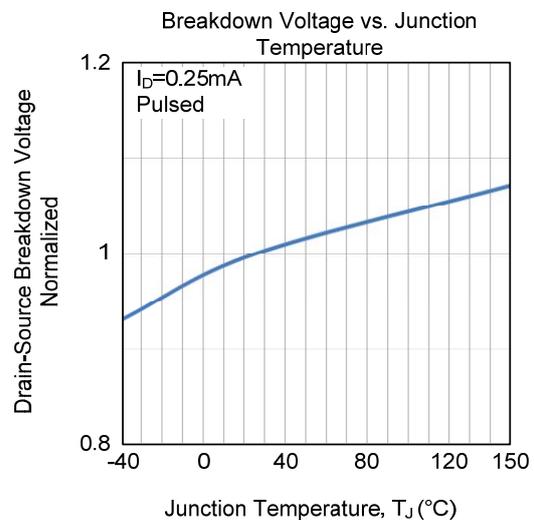
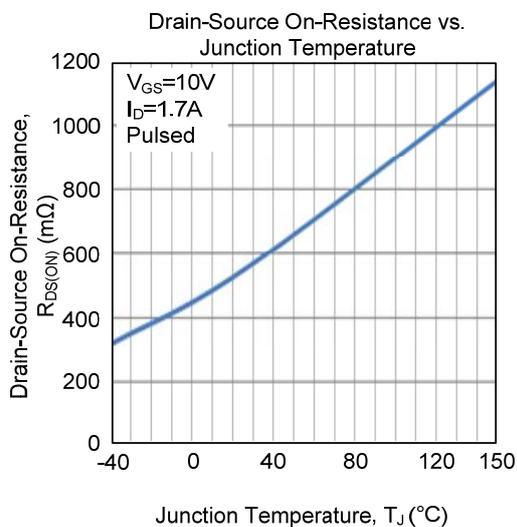
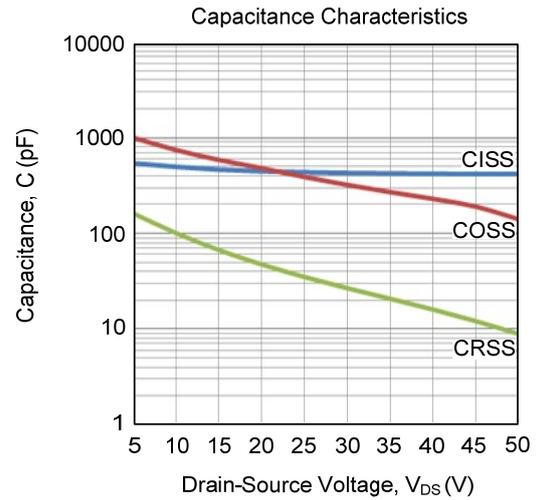
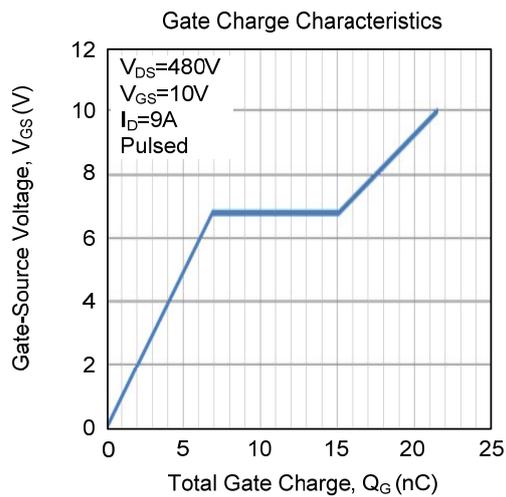
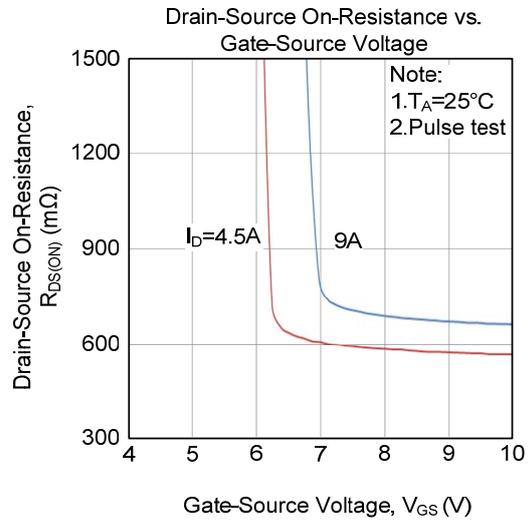
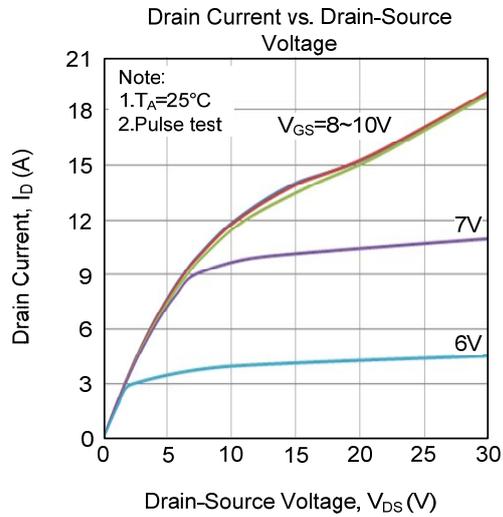


Unclamped Inductive Switching Test Circuit

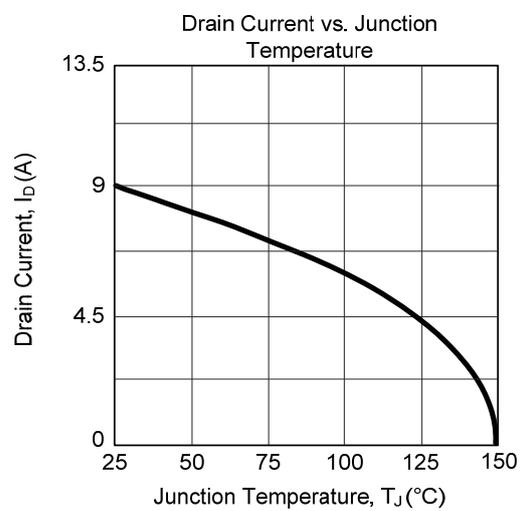
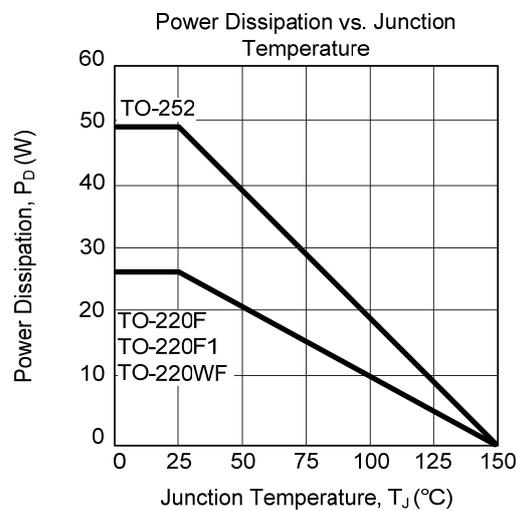
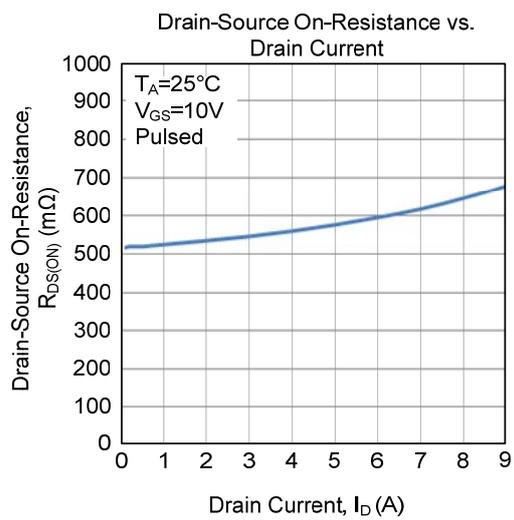
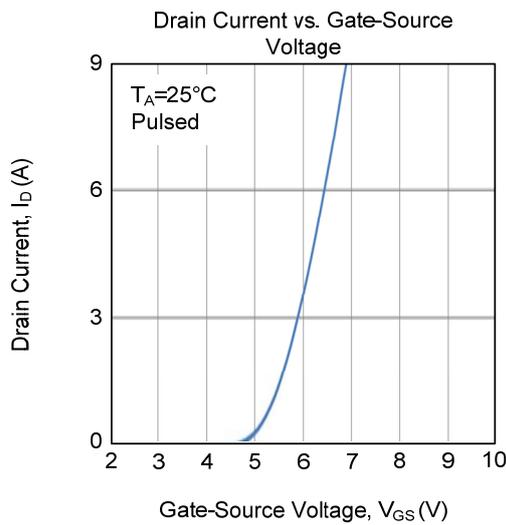
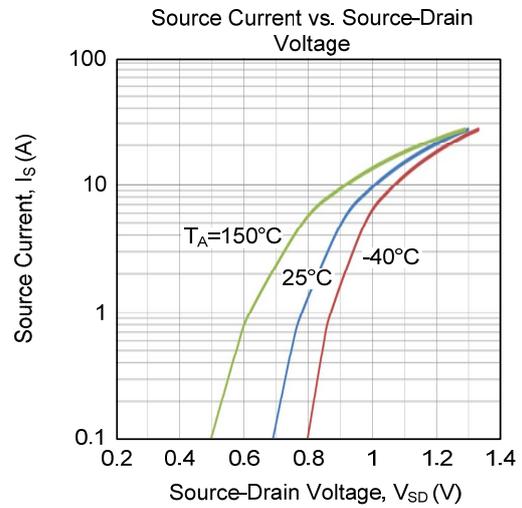
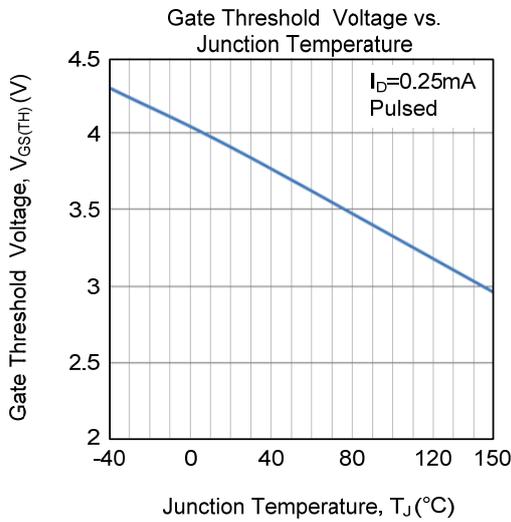


Unclamped Inductive Switching Waveforms

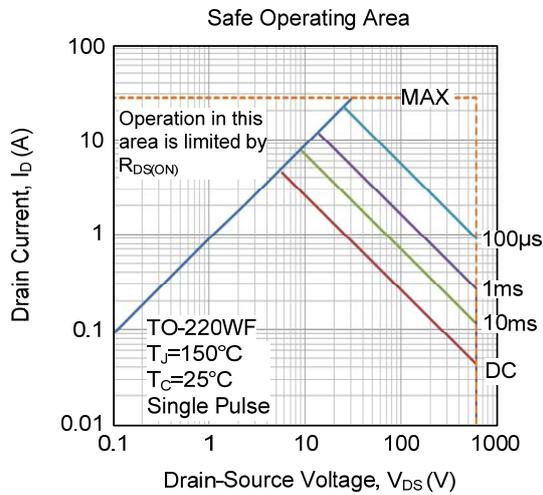
## TYPICAL CHARACTERISTICS



## ■ TYPICAL CHARACTERISTICS (Cont.)



### ■ TYPICAL CHARACTERISTICS (Cont.)



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